SEMESTER EXAMINATION, DECEMBER, 2025

Course Name: - B.Tech(ECE) **Semester:- III**

Paper Name: - Signals and Systems **Paper Code: - NEC 304**

Time - 3 Hrs + 20 minutes per hour extra time for V.I. & examinees with writer. Max Marks-70

समय– 3 घण्टे + 20 मिनट प्रति घंटे अतिरिक्त–दृष्टिबाधित एवं सह लेखक परीक्षार्थियों के लिए। अधिकतम अंक–70

Instructions:

- The question paper consists of three sections namely A, B, C. All sections are compulsory.
- Section A- Each question carries **3 mark. All questions are compulsory**.
- Section B- Answer any **5 out of 7** given questions. Each question carries **7 marks**.
- Section C- Answer any **2 out of 3** given questions. Each question carries **10 marks**.

Section – A (खण्ड–अ)

Multiple Choice Questions (बहुविकल्पीय प्रश्न)

1. Answer all the following questions. 5x3 =15

निम्नलिखित सभी प्रश्न अनिवार्य हैं।

i) Direct delta function $\delta(t)$ is defined as

A) $\delta(1) = 1$

B) $\delta(-1) = 1$

C) $\delta(0) = 0$

D) $\delta(0) \cong \infty$

ii) The Convolution of $\delta(t-2) * x(t)$ is equal to

A) $x(t)$

B) $x(t+2)$

C) $x(t-2)$

D) $2x(t)$

iii) The Fourier Transform is applicable to

A) Periodic Signal

B) Non-Periodic Signal

C) Periodic Signal and Non-Periodic Signal

D) Even Signal

iv) The Laplace transform of signal $x(t) = te^{-at}u(t)$ is

A) $1/(s+a)^2$

B) $1/s$

C) $1/(s+a)$

D) $1/s^2$

v) Determine the nyquist rate of signal $x(t) = Sin^2(200\pi t)$

A) 100 Hz

B) 200 Hz

C) 300 Hz

D) 400 Hz

Section – B (खण्ड–ब)

Short Answer Questions (लघुउत्तरीय प्रश्न)

2. Answer any five of the following questions. 5x7=35
निम्नलिखित में से किन्हीं पाँच प्रश्नों के उत्तर दें।

i. For each system determine whether it is (1) memoryless (2) causal (3) linear (4) time-invariant (5) stable

(a) $y(t) = x(2t+1)$ (b) $y[n] = x[-n]$

ii. Determine and sketch the convolution of two signal

$x(t) = 1$ for $-1 \le t \le 1$ and $h(t) = \delta(t+1) + 2\delta(t+2)$

iii. Find the Fourier transform of signal

(a) $x(t) = \cos(\omega_0 t)$ (b) $x(t) = e^{-at}u(t)$

iv. Find the Laplace transform of signal

(a) $x(t) = \sin(\omega_0 t)u(t)$ (b) $x(t) = u(2t-1)$

v. Explain about sampling process and sampling theorem.

vi. Determine energy and power of following signals.

(a) $x(t) = e^{-2t}\, u(t)$ (b) $x(t) = e^{j(2t+\pi/4)}$

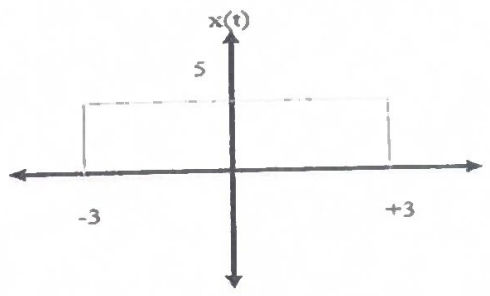
vii. Describe causality and stability of linear shift invariant systems.

Section – C (खण्ड–स)

Descriptive Questions (विवरणात्मक प्रश्न)

3. Answer any two of the following question. 2x10=20
निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर दें।

i) For the signal x(t) sketch



(a) $x(3t)$ (b) $x(t/6)$ (c) $x(3t+2)$ (d) $x(-t)$ (e) $x(-2t-1)$ (f) $x(-1/3t+1)$

ii) Find the convolution output of signals

(a) $x(t) = e^{-3t}u(t)$ and $h(t) = u(t-2)$ (b) $x(t) = e^{-4t}[u(t)-u(t-2)]$ and $h(t) = e^{-2t}u(t)$

iii) Solve the second order linear differential equation

$$d^2y(t)/dt^2 + 5dy(t)/dt + 6y(t) = dx(t)/dt + x(t)$$

For Initial Condition $y(0^-)=2$, $y'(0^-)= 1$ and input $x(t) = e^{-4t}u(t)$

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